

TURKISH SPECIES OF SEMPERVIVUM

C. W. MUIRHEAD

The complications of identification which have arisen in connection with the Turkish species of *Sempervivum* seem to stem mainly from the fact that for a long period attempts were made to equate them with eastern European yellow-flowered species, whose own identity was a matter of considerable confusion.

In 1856 Boissier & Huet (Diagn., Ser 2, 2:60) described *S. armenum*, a yellow-flowered species with glabrous leaves collected by Huet at Kassuklu, in Turkish Armenia. This species Boissier in 1872 (Fl. Orient. 2:797) reduced to synonymy under *S. globiferum* L. describing here a glandular-leaved species and including Huet's type in his list of *exsiccatae*. This has led to the application of the name '*S. globiferum* L.' or '*S. ruthenicum* Koch' to almost any Turkish or Caucasian species with yellow flowers and either glabrous or glandular leaves, resulting in an almost endless confusion of nomenclature. From herbarium material so far examined, however, it is now clear that no E European species has yet been found in Turkey. On restoring *S. armenum* Boiss. & Huet, with its unmistakable description of Huet's type, we are left with a complex group of closely allied species with glandular leaves, widespread throughout Turkey and extending into the Caucasus. These can only be described fully as further material becomes available and it is possible to examine the plants in a living condition.

Since Boissier's description of *S. armenum* in 1856 no other allied species appears to have been published until 1939, when Borissova described *S. glabrifolium* from the Artvin district. This was followed in 1940 by Turrill's description of *S. minus* based on E. K. Ball's collections on Haldizan Dağ. Since then recent expeditions have collected material in many parts of Turkey, from which several interesting facts emerge, the most important being that—

1. *S. armenum* Boiss. & Huet is a distinct species and is not a synonym of *S. ruthenicum* Schnittsp. & Lehm.
2. *S. glabrifolium* Borissova is distinct and not a synonym of *S. armenum*.
3. All material so far examined from Turkey has been yellow-flowered. In the Caucasus and N Iran red-flowered species occur, but it is doubtful if they will be found to extend into Turkey.
4. Of the 11 species here described only one, *S. transcaasicum* is at present known to occur outside Turkey. It is probable that *S. davisii* and *S. artvinense* and possibly others will be found in adjoining regions of the Caucasus and Iran.

All the species described in this paper have been grown from plants collected in the wild. There are herbarium specimens of wild origin for all except *S. artvinense*, *S. furseorum* and *S. ispartae* which were collected only as living plants. The C. numbers refer to herbarium material of cultivated specimens at Edinburgh. All the specimens cited below have been examined.

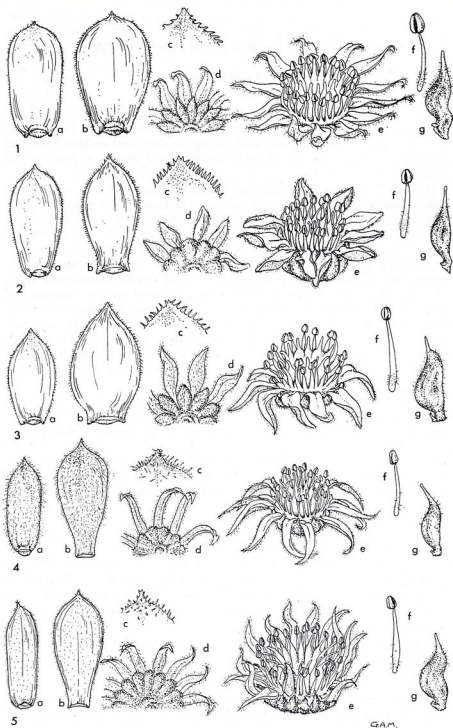


FIG. 1. 1. *Sempervivum armenum*. 2. *S. glabrifolium*. 3. *S. staintonii*. 4. *S. furseorum*. 5. *S. gillianii*. a, stem leaf. b, rosette leaf. c, apex of rosette leaf. d, dorsal view of flower. e, flower. f, stamen. g, carpel. a, b $\times 1$. c, d, e $\times 2$. f, g $\times 3$.

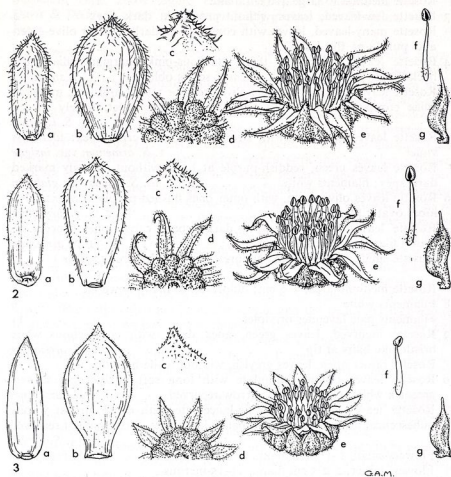


FIG. 2. 1. *Sempervivum davisii*. 2. *S. artvinense*. 3. *S. brevipilum*. Other legend as in fig. 1.

KEY TO SPECIES

- 1 Rosette leaves glandular all over 7
- + Rosette leaves more or less glabrous when mature, only young rosettes with scattered glandular hairs, soon disappearing 2
- 2 Rosette small to medium, 2-4 cm diam. 3
- + Rosette medium to large 4-6 cm diam. 6
- 3 Rosette few-leaved, leaves without prominent dark apex 4
- + Rosette many-leaved, leaves with conspicuous dark apex or olive-green and purple at the base 5
- 4 Rosette leaves ovate, very thick, glaucous-pink, marginal ciliae bent backwards; petals ultimately reflexed; scales oblong 3. *S. staintonii*
- + Rosette leaves lanceolate-ovate, olive-green or purplish-brown; marginal ciliae conspicuous, 1-2 mm long; scales small, erect, widely spaced 4. *S. ispartae*
- 5 Rosette leaves glaucous, with strongly marked purple apex; filaments violet 1. *S. armenum* var. *insigne*
- + Rosette leaves green, reddish-purple at base, without strongly marked dark apex; filaments white 10. *S. minus* var. *glabrum*
- 6 Rosette leaves olive green, with outer ones flushed purple at apex; calyx lobes ovate; filaments white 2. *S. glabrifolium*
- + Rosette leaves blue-green, apex dark-tipped; calyx lobes lanceolate-acute; filaments pale lavender 1. *S. armenum*
- 7 Rosette small, 1-3 cm diam.; inflorescence few-flowered (3-8 fls.) 10. *S. minus*
- + Rosette medium-large, 3-6 cm; inflorescence many-flowered 8
- 8 Filaments white 9
- + Filaments pale lavender or violet 11
- 9 Rosette incurved, leaves green, apex dark, with conspicuous white bristle-like hairs at tip 6. *S. artvinense*
- + Rosette rather open, leaves greyish, without white hair tip 10
- 10 Rosette leaves oblong-spathulate with long soft pubescence; flowers greenish white, petals linear, narrow recurved 7. *S. furseorum*
- + Rosette leaves ovate to oblong-lanceolate with dense almost woolly pubescence; flowers pale yellow, petals lanceolate, spreading not recurved 5. *S. davisii*
- 11 Flowers small, 1-1.5 cm diam., 9-11-merous 9. *S. brevipilum*
- + Flowers larger, 2-2.5 cm diam., 11-15-merous 12
- 12 Flowers 13-15-merous, scales rounded, horizontal 8. *S. gillianii*
- + Flowers 11-13-merous, scales rectangular strongly upcurved 11. *S. transcaucasicum*

1. *S. armenum* Boiss. & Huet in Boiss., Diagn. ser. 2, 2:60 (1856). Plate 1A. Figs. 1, 1; 4. Syn.: *S. braunii* Led. var. *glabrum* Medw., Pl. Caucasus 169 (1915).

Type. Turkey: Inter Baiburt et Erzeroum, in valle Kassuklu, viii 1853. *Huet du Pavillon* (iso-K).

A4 Çankiri: Ilgaz Dağ, 2300m, D. 25085—plants only, C.5960, C.5961. A7.

Gümüşane: above Köse, between Kelkit & Gümüşane, 1750 m, rocky igneous slopes, 2 viii 1957, Davis & Hedge D. 31957; Köse Dağ, 15m. SE of Gümüşane, Furse 9171. Giresun: Balabandaglari, above Tamdere, 1800 m, scree, 6 viii 1952, Davis, Dodds & Çetik D.20486. Trabzon: Maçka, growing in crevices on non-lime rock, 600 m, 17 vii 1933, E. K. Balls 484. A8 Rize: Cermanin Tepe, above Cimil, 3200 m, on rocky S slopes, 29 viii, 1952, Davis & Dodds D.21071. A8 Erzurum: dry ground near Erzurum, vii 1960, Furse.

S. armenum was first described by Boissier and Huet (1856) and characterised by glabrous, mucronate, rosette leaves, pubescent upper cauline leaves and erect subquadrate scales. Since then the species has been much confused with the glandular-leaved complex identified by Russian and other botanists as *S. globiferum* L. and also with quite different yellow-flowered European species also included under this name. Czeaczott (Feddes Rep. Beih. 107: 185, 1939) suggested that this species was in fact distinct. Later Turrill (Hook., Icon. Pl. 3401, 1940) agreed with this view but sufficient evidence was lacking in existing herbarium material and it was not until the plant was collected by E. K. Balls on Haldizan Dağ and more recently in other localities by Davis, McNeill and Furse that it was possible to re-establish its identity. As now understood, it is a plant with medium and rather large, glaucous rosettes of dark-tipped, glabrous, ciliate-margined leaves and very similar in appearance to some forms of the European *S. tectorum* L. Stolons (in the type) are few, and the juvenile rosettes, glandular at first, soon became glabrous, the upper stem leaves alone being pubescent. The inflorescence is dense, with many sessile or subsessile 12-14-partite flowers. The calyx lobes are lanceolate-acute and the petals are pale yellow or greenish, more or less purple tinged at the base, glandular below and usually with scattered glands over the whole of the upper surface; the filaments are lavender, the anthers yellow and small; the subquadrate scales are nearly contiguous. The carpels are green and shortly glandular, with strongly divergent styles.

S. armenum has a wide range in Turkey, from the province of Ankara to Rize and Erzurum. It is found quite frequently in the same area as glandular leaved species and it is extremely probable that they hybridise.

S. glabrifolium Boiss., the only other Turkish species which might possibly be confused with *S. armenum*, is easily distinguished by the olive-green, shining leaves heavily marked with purple at the apex or in the whole of the upper half of the leaf and by the obtuse, very swollen calyx lobes. The Caucasian species, *S. sosnowskyi* from the Bakuriani region appears to be more closely related to *S. armenum* than to *S. glabrifolium* and may prove to be a geographical extension of this species.

var. *insigne* Muirhead, var. *nov.*

A var. *armeno* rosulis minoribus expansis, foliis caulibus et filamentis atropurpureis differt.

Turkey. A4 Ankara: near Kizilcahaman, c. 1200 m, very dry limestone gravel, 22 vii 1956, McNeill 284 (holo-E), C.5962. Çankiri: Isik Dağ, near summit, 17 viii 1960, Khan, Prance & Ratcliffe 724 B.

Rosettes small, 2-3 cm diam., highly coloured, with many offsets; cauline leaves imbricate, flushed rose-purple; petals violet at base; filaments violet.

2. *S. glabrifolium* Borissova in Komarov, Fl. URSS 9:22, 471 (1939). Plate 1B. Figs. 1, 2; 4.

Type. Turkey. A8 Artvin: Tzriya, fl. Czoroch 9 vi 1914, Turkewicz 768.

A8 Artvin: Çoruh gorge, between Artvin and Borçka, 300–400 m, igneous rocks, conglomerate, 21 vi 1957, Davis & Hedge D.29839. Artvin to Ardanuç, Eruptiv Felsen, 20 km südlich Artvin, 730 m, 10 vii 1959, A. Huber-Morath 15340.

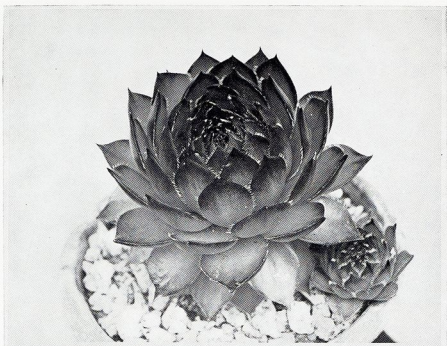
Misidentified as *S. armenum* auct.: Wale in Bull. Alp. Gard. Soc. 9:106, 234 (1942); Grossheim, Key to Pl. Caucasus 64 (1949); Fl. Kavk. 4:260 (1950); Takhtadzhyan, Fl. Armen. 3:347 (1958); Gurgenidze in Not. Syst. Geogr. Inst. Bot. Tiflis 25:10 (1965).

S. glabrifolium is clearly allied to *S. armenum* and the Caucasian *S. sosnowskyi*, all three with the mature rosette leaves glabrous but with the juvenile rosette leaves \pm glandular. In the past, it has been much confused with *S. armenum* but in actual fact these are two very distinct species. In rosette it is easily separated from *S. armenum* by the numerous short offsets and the olive-green, very swollen leaves conspicuously flushed with dark purple near the outer edge of the rosette. In flower, the swollen and strongly incurved ovate calyx lobes and white filaments are very characteristic and separate *S. glabrifolium* both from *S. sosnowskyi* and *S. armenum*.

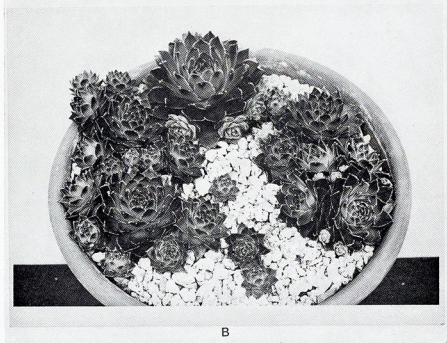
S. glabrifolium is at present known only from the Çoruh gorge in Artvin but might be expected to occur elsewhere in NE Turkey and possibly also in the adjoining Caucasian mountains. *S. sosnowskyi*, which is recorded in the SW Caucasus appears to be more clearly related to *S. armenum* than to *S. glabrifolium* and may be a geographical extension of that species. It also has only been found in one locality as yet while *S. armenum* is perhaps the most widely distributed species in Turkey.

3. *S. staintonii* Muirhead, sp. nov. Plate 2A. Figs. 1, 3; 5.

Rosula 3–4 cm diam., subplana, paucifolia. *Rami* propaginiferi 3–5, breves, 2–3 cm longi, valides, pubescentes, primo rubicundi tum fusci, foliis parvis paucioribus, foliis rosularum juvenilium glanduloso-pubescentibus. *Folia* rosularia pauca, 1.5–2 cm longa, 7–8 mm lata et 5 mm crassa, ovata vel obovata, acuta, glauca, viridia vel rubicunda, glabra, margine valde glanduloso-ciliata, ciliis 1 mm longis, retrorsis, apice minimis rubris. *Caulis florifer* 9–12 cm altus, dense glanduloso-pubescent, pilis rubris. *Folia* caulina imbricata, ovata vel lanceolata, rubicunda, acuta, 1–1.5 cm longa, 1 cm lata, apice acuta, inferiore glabra, margine ciliata, superiore utrinque glanduloso-pubescentia, pilis rubris. *Inflorescentia* 3–4 cm diam. ramis multifloris; alabastra obtusa, pedicellis longis (usque 3–4 mm). *Flores* 1–1.5 cm diam., 10–12-meri. *Bractee* lineares vel lanceolato-lineares, glanduloso-pubescentes. *Calyx* 5 mm longus, glanduloso-pubescent, segmentis ovatis rubro-viridibus 2.5–3 mm longis 1 mm latis, crassis. *Petala* oblongo-lanceolata, acuta, lutea, primum stellatim expansa tum valde reflexa, 11 mm longa 3 mm lata, carinata, in pagina inferiore dense glanduloso-puberula, viridia, in pagina superiore glabra, praeter ad apicem. *Stamina* 20–24, 6–8 mm longa, filamenta alba, inferne dilatata et valde glanduloso-pilosa; antherae flavae. *Squamae* oblongae, angustae, sursum flexae, disjunctae.

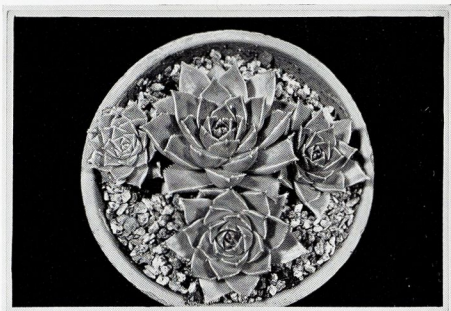


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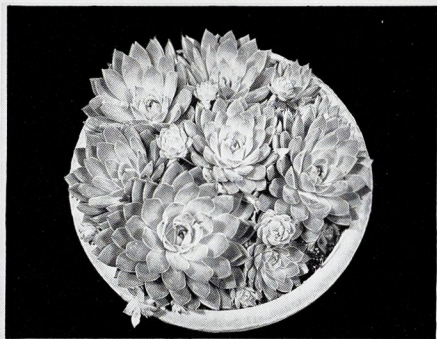


B

PLATE 1. Rosettes of: A, *Sempervivum armenum* Boiss. & Huet; B, *S. glabrifolium* Boiss.



A



B

PLATE 2. Rosettes of: A, *Sempervivum staintonii* Muirhead; B, *S. brevopilum* Muirhead.

Carpella 6 mm longa; ovaria 4 mm longa, 2 mm lata, viridia, utrinque glanduloso-puberula, inferne glabrescentia; styli \pm glabri, 1.5–2 mm longi, divergentes.

Turkey. A8 Artvin: Artvin to Yusufeli road, in granite crevices, NE aspect, 1800 m, 8 vii 1960, *Stainton & Henderson* 6061 (holo—E), C.5971.

This species is quite unlike any known Turkish *Sempervivum*. It is easily recognised by the few-leaved rosettes of very fleshy, almost glabrous leaves, glaucous green in winter, but turning bronze-red in summer. The flowers are distinctly pedicellate, rather small, with ultimately recurved petals. The most striking character, however, lies in the shape of the scales, which are oblong, considerably longer than wide and erect. Oblong scales are usual in the genus *Jovibarba* but rare in *Sempervivum*. The species is at present known only from one locality in NE Turkey, but plants have been collected in the neighbourhood of Yusufeli which may prove to be hybrids of *S. staintonii* with a glandular-leaved species.

4. *S. ispartae* Muirhead, sp. nov. Figs. 3, 4.

Rosula 3–4 cm diam., subplana, paucifolia. *Rami* propaginiferi desunt. *Folia* rosularia pauca, 1.5–2 cm longa, 1 cm lata, ovata vel oblongo-lanceolata, dorso carinata, viridi—brunneo-purpurascens, fulgida, glabra, vel in carina dorso et ad apicem pilis paucis rigidis glanduliferis, margine dense et aequaliter ciliata, ciliis 1–2 mm longis. *Caulis florifer* 12–15 cm altus, dense glanduloso-pubescent, pilis rigidis. *Folia caulina* laxa divergentia, oblanceolata, apice acuta, viridia vel rubicunda, 1.5–2 cm longa, 5–7 mm lata, inferne dorso pilis paucis rigidis, superne utrinque glanduloso-pubescentia, margine dense ciliata. *Inflorescentia* congestiflora, c. 4 cm diam., ramis multifloris 30–40-floris, alabastra acuta. *Flores* 2.25 cm diam., sessiles vel pedicellis 2–4 mm longis, 9–11-meri. *Bractee* lanceolatae vel lineari-lanceolatae, glanduloso-pubescentes. *Calyx* cum receptaculo 4 mm longus, dense glanduloso-pubescent, viridis, segmentis ovatis 2 mm longis, crassis, apice obscuro. *Petala* viridi-alba, carinata, 1 cm longa, dorso et margine et in pagina superiore solum ad apicem glanduloso-pubescentia. *Stamina* 20–22, 7–8 mm longa; filamenta alba, inferne dilatata et valde pubescentia; antherae flavae. *Squamae* parvae, rotundato-quadratae, disjunctae. *Carpella* 4–5 mm longa, viridia, ovaria 2–3 mm longa, 1.5 mm lata, utrinque glanduloso-pubescentia, inferne glabrescentia; stylus 1.2 mm longus, fere glaber, erectus vel divergens.

Turkey. C3 Isparta: near Dedegöl Dağ, on metamorphic rock, about $\frac{1}{2}$ km before crossing river between Selkose and Oruz Gaz Yayla, 1300 m, rare, 1 viii 1949, *Davis* 15923B, C.5965 (holo—E).

This very distinct species has been collected only once from an area in southern Turkey where the genus is apparently rare. A glandular leaved species was found at the same time, but this did not flower in cultivation. The olive-green rosette leaves, which are glabrous except for the marginal ciliae and a distinct line of stiff glandular hairs on the dorsal keel are unlike those of any other Turkish species. The bristly pubescence of the stem and inflorescence is also characteristic. It is perhaps nearest in habit to *S. staintonii*, but in that species the thick, swollen leaves, glandular pubescence and scales are quite different.

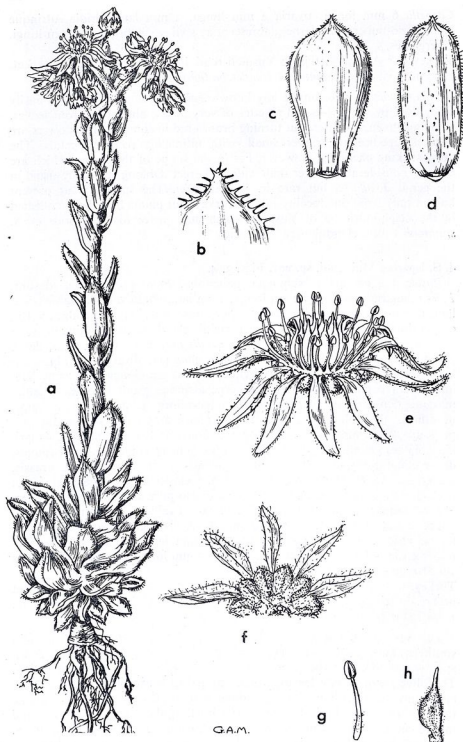


FIG. 3. *Sempervivum ispartae*. a, whole plant $\times 1\frac{1}{2}$. b, apex of rosette leaf $\times 4$. c, rosette leaf $\times 2$. d, stem leaf $\times 2$. e, flower $\times 4$. f, dorsal view of flower $\times 4$. g, stamen $\times 5$. h, carpel $\times 5$.

5. *S. davisii* Muirhead, sp. nov. Plate 3B. Figs. 2, 1; 5.

A *S. transcaucasicus* rosulis dense et molliter pubescentibus, petalis et filamentis albis, squamis fere contiguas differt.

Rosula 3-4 cm diam., foliis semiapertis. *Rami* propaginiferi pauci, breves, 2-3 cm longi. *Folia* rosularia cinereo-viridia, dense glanduloso-pubescentia, oblanceolata vel obovata, apice nonnunquam brunneo-rubra, abrupte mucronata, 1.5-2 cm longa, 1 cm lata. *Caulis florifer* 10-12 cm altus, erectus, dense glanduloso-pubescentis pilis brevibus. *Folia caulina* numerosa, imbricata, oblanceolata, acuta, utrinque breviter glanduloso-pubescentia, cinereo-viridia, plerumque apice brunneo-rubra. *Inflorescentia* compacta vel expansa, 20-40-flora, glandulosa, alabastra obtusa, pedicellis 2-4 mm longis. *Flores* c. 2 cm diam., 13-14-meri. *Calyx* cum receptaculo 4-5 mm longus, dense glanduloso-puberulus; segmenta 2-2.5 mm longa, ovato-lanceolata, acuta, apice purpurea. *Petala* expansa, lanceolata, acuta, 8-10 mm longa, 2 mm lata, pallide flava. *Stamina* 5-6 mm longa, filamenta alba, inferne glandulosa, antherae fere globosae, flavae. *Squamae* rotundatae, fere contiguae, triangulatae, horizontales. *Carpella* 5-6 mm longa, viridia, exteriore fere glabra, interiore glanduloso-pubescentia; styli c. 2 mm longi, erecti vel parum divergentes.

Turkey. A8 Artvin: Çoruh gorge, between Artvin and Ardanuç, igneous rocks, 700 m, plant very hairy, 26 vi 1957, *Davis & Hedge D.30044* (holo—E), C.5966; Artvin—Ardanuç, Eruptiv Felsen, 20 km südlich Artvin, 730 m, 10 vii 1959, *Huber-Morath 15340* (with *S. glabrifolium*); distr. Ardanuç, Kordevan Dağ, 2300 m, *Davis & Hedge D.30407*—plants only. B10 Kars: d. Aralik, Küçük Ağrı Dağ, near Serdar Bulak, 2300 m, grassy slopes at edge of *Betula* forest, flowers pale yellow, always hairy, 20 vii 1966, *D.46887*. A9 Erzurum: Karaorgan to Horasan, igneous rocks, *Davis & Hedge D.30694*.

In the mountains of NE Turkey, there is a complex and interesting group of yellowish-flowered *Semperviva* with glandular rosettes. These are extremely variable in size and pubescence, which may be densely hairy to almost woolly, but in flower structure show remarkably little deviation, with 12-15-merous flowers, white filaments and shallow, rounded, more or less horizontal scales. Some of the forms included under *S. davisii* may prove to be critically distinct on further collection, and it is probable that this species may also occur on mountains on the Soviet side of the frontier.

6. *S. artvinense* Muirhead, sp. nov. Fig. 2, 2; 5.

Rosula 3-4 cm diam., foliis numerosis, leviter incurvis. *Rami* propaginiferi paucae 1-3, breves, validi, 2-4 cm longi, foliosi, cinereo-fusci, pilis rigidis dense pubescentes. *Folia* rosularia c. 2.5 cm longa, 7 mm lata, viridia, oblongo-lanceolata, crassa, dorso carinata, ad apicem rubra, mucronata, setis albis, rigidis, utrinque dense et breviter glanduloso-pubescentia, margine ciliata. *Caulis florifer* 12-13 cm altus, breviter glanduloso-pubescentis. *Folia caulina* c. 2 cm longa, 5-6 mm lata, laxe imbricata, incurva, viridia vel roseo-tincta, apice minute purpurea, oblongo-lanceolata, acuta, utrinque breviter et dense pubescentia. *Inflorescentia* densa, ramis 2-3, c. 20-25-floris, floribus in axillis foliorum superiorum; alabastra obtusa. *Flores* 2.5 cm diam., sessiles vel pedicellis 1-3 mm longis, 12-13-meri. *Calyx* cum recep-

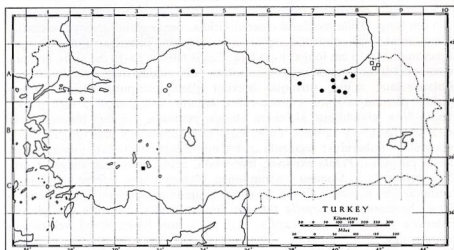


FIG. 4. Distribution in Turkey of: ● *Sempervivum armenum*, ○ *S. armenum* var. *insigne*, □ *S. glabrifolium*, ▲ *S. furseorum*, ■ *S. ispartae*.

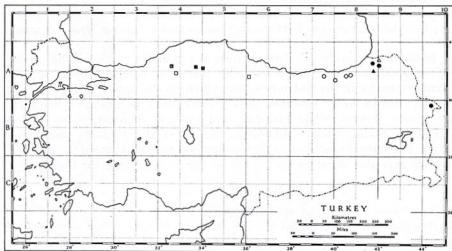


FIG. 5. Distribution in Turkey of: ○ *Sempervivum minus*, ● *S. davisii*, ▲ *S. artvinense*, ▲ *S. staintonii*, ■ *S. gillianii*, □ *S. brevipilum*.

taculo 4–5 mm longus, dense glanduloso-pubescent; segmenta ovata, 3–3.5 mm longa, pallide viridia, crassa, incurva. *Petala* 11 mm longa, 2.5 mm lata, lanceolata, acuta, flavido-alba, dorsi et in pagina superiore ad apicem glanduloso-pubescentia. *Stamina* 6–7 mm longa; filamenta alba, inferne applanata, triente infimo pubescentia; antherae luteae. *Squamae* flavae, rotundato-quadratae, disjunctae, valde recurvae. *Carpella* pallide viridia, 5–6 mm longa, utrinque dense glanduloso-pubescentia; styli 1.5 mm longi, divergentes, ad basem tantum pubescentes.

Turkey. A8 Artvin: growing on mountain above village, 2200 m, igneous rocks, 19 vi 1957 *Davis & Hedge* D.30410, C. 5963 (holo—E).

Closely allied to *S. davisii*, but with many-leaved, incurved rosettes. The leaves are green with a small dark apex which terminates in a few white, bristle-like hairs. The incurved swollen calyx lobes are ovate and quite different from those of *S. davisii* and the scales are yellowish, rounded rectangular and strongly recurved.

7. *S. furseorum* Muirhead, sp. nov. Plate 3A. Figs. 1, 4; 4.

A *S. davisii* foliis rosulis oblongo-spathulatis, petalis anguste linearibus, recurvis facile distinguenda.

Rosula 3–4 cm diam., multifoliata, semi-aperta. *Rami* propaginiferi desunt. *Folia* rosularia 2.5–3.5 cm longa, c. 7 mm lata, cinereo-viridia, obovata vel oblongo-spathulata, acuminata, apice minute purpurea vel distincte marginata, utrinque molliter glanduloso-pubescentia, pilis longis et brevibus, margine dense ciliata, ciliis non multo longioribus quam pubescentia. *Caulis florifer* c. 20 cm altus, dense et molliter pubescens. *Folia caulina* imbricata, cinerea, apice minute purpurea, oblonga, acuta, utrinque dense glanduloso-pubescentia, margine ciliata, ciliis longioribus quam pubescentia. *Inflorescentia* 4–5 cm diam., ramis 3–4, multifloris (25–30-floris); bracteae lineari-lanceolatae; alabastra oblonga, acuta. *Flores* c. 2.5 cm diam., sessiles vel pedicellis brevibus. *Calyx* viridis, apice minute purpureus, cum receptaculo 4–5 mm longus, dense glanduloso-pubescent, segmentis lineari-lanceolatis, 4 mm longis 1 mm latis, acutis. *Petala* 12–13, albo-viridia, carinata, anguste linearia, acuta, 12 mm longa, 1 mm lata, utrinque glanduloso-pubescentia, valde recurva. *Stamina* c. 24, 6–7 mm longa; filamenta alba, inferne glanduloso-pilosa; antherae flavae. *Squamae* parvae, tenues, triangulares, haud contiguae, subvirides. *Carpella* pallide viridia, 5–6 mm longa; ovaria 3–4 mm longa, intus glanduloso-pubescentia, extra \pm glabrescentia; stylis 2–2.5 mm longis, fere glabris, divergentibus.

Turkey. A8 Trabzon: south of Rize, on rocky slopes in eastern Pontus, 1800–2500 m, 4 vii 1960, *Furse & Syngé* 809B, C. 5964 (holo—E).

Although closely allied to *S. davisii* this species is easily distinguished by the oblong-spathulate leaves with a minute dark tip or with the leaf apex clearly outlined in purple. In flower, the linear, recurved petals, glandular on both surfaces and small, triangular scales separate it from both *S. davisii* and *S. transcaucasicum*.

8. *S. gillianii* Muirhead, sp. nov. Figs. 1, 5; 5.

Affinis *S. transcaucasicum* sed foliis acuminatis apice recurvis et squamis rotundatis differt.

Rosula 4–6 cm diam., semi-aperta, dense multifoliata. *Stolones* breves validis, brunneo-pubescentes. *Folia* rosularia oblongo-spathulata, breviter acuminata viridia, apice brunnea, recurvata, c. 3 cm longa, 1 cm lata et 3 mm crassa, utrinque breviter glanduloso-pubescentia, margine ciliata. *Caulis florifer* 12–15 cm altus, erectus, dense glanduloso-pubescentia. *Folia caulina* numerosa, imbricata, oblongo-lanceolata, apice brunnea, leviter recurva, utrinque dense et breviter glanduloso-pubescentia. *Inflorescentia* densa, 5–6 cm diam., ramis 2–3-multifloris; alabastra acuta. *Flores* 2.5 cm diam., 13–15-meri, sessiles vel pedicellis 2–3 mm longis. *Calyx* cum receptaculo 5–6 mm longus, glanduloso-pubescentia; segmenta ovato-lanceolata, acuta, viridia, apice purpurea, incurva, 3–4 mm longa, 2 mm lata. *Petala* lineari-lanceolata, viridi-lutea, ad apicem purpurea, 1 cm longa, 2 mm lata, in pagina inferiore dense glanduloso-puberula, in superiore glabra vel parce glandulosa. *Stamina* 5 mm longa, filamenta atropurpurea, inferne dense glanduloso-pubescentia. *Squamae* rotundatae, fere contiguae, horizontales. *Carpella* 5 mm longa; ovaria c. 3.5 mm longa, viridia, utrinque dense glanduloso-puberula; styli 1–2 mm longi, valde divergentes, fere ad apicem pubescentes.

Turkey. A4 Zonguldak: Kel Tepe, above Karabük, 1800 m, rocky limestone slopes, 3 viii 1962. *Davis & Coode* D.38805A, (holo—E) C. 5967. Kastamonu: N side of Ilgaz Dağ, 2100 m, rocky limestone slopes, 28 vii 1962, *Davis, Coode & Yaltirik* D.38453; Tossia, Gaurdagh, in subalpinis, 29 vii 1892, *Sintenis* 4897 (K).

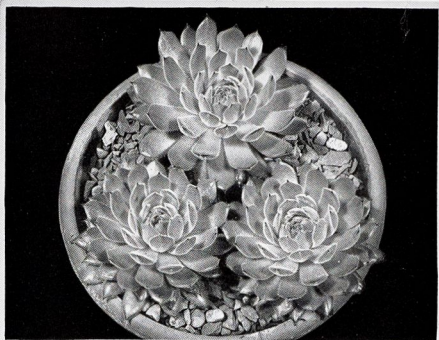
S. gillianii is near to *S. transcaucasicum*, but has open, rather flattish rosettes with narrower, more acuminate leaves, distinctly recurved and sometimes highly coloured at the apex. The flowers are 13–15-merous, strongly violet tinged, with ovate, swollen calyx lobes and rounded, almost contiguous horizontal scales which are quite different from those of the Caucasian species.

I have much pleasure in naming this species after Miss Gillian Meadows who has drawn the informative illustrations for this paper.

9. *S. brevopilum* Muirhead, sp. nov. Plate 2B. Figs. 2, 3; 5.

A *S. gillianii* floribus multo minoribus facile distinguenda.

Rosula c. 3 cm diam., semi-aperta, multifoliata, *Folia rosularia* ovata vel ovato-lanceolata, acuta, glauco-viridia, carnosa, apice purpurea, minuta, 1–2 cm longa, 7.5 mm lata, utrinque minute glanduloso-pubescentia, margine breviter glanduloso-ciliata. *Caulis florifer* 6–9 cm altus, dense et brevissime glanduloso-pubescentia, paucifolius. *Folia caulina* oblanceolata, acuta, 1–2 cm longa, 4–6 mm lata, laxe imbricata, crassa, minute glanduloso-pubescentia, apice leviter purpurea. *Inflorescentia* 20–30-flora, ramis 3–4; alabastra obtusa; pedicelli 2–4 mm longi; bractae variabiles, lineares vel lanceolatae, parvae, pubescentes. *Flores* 1–1.5 cm diam., 10–11-meri. *Calyx* cum receptaculo 3–5 mm longus, glanduloso-pubescentia; segmenta ovata vel triangulata, crassa, viridia, valde incurvata, 2–3 mm longa, 2 mm lata.

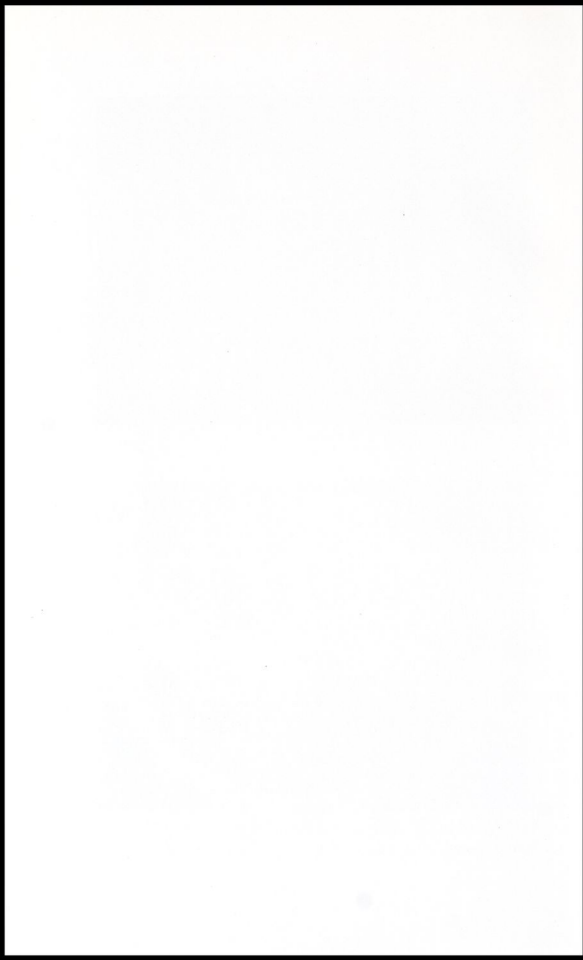


A



B

PLATE 3. Rosettes of: A, *Sempervivum furseorum* Muirhead; B, *S. davisii* Muirhead.



Petala ovato-lanceolata, viridi-lutea, 5–7 mm longa, 1–2 mm lata, in pagina inferiore glanduloso-pubescentia, viridi-alba. *Stamina* 3–4 mm longa; filamenta ad basem tumida, atropurpurea; antherae flavae. *Squamae* parvae subrotundatae, brevissimae, fere contiguae. *Carpella* 3–4 mm longa, glandulis sparsis; ovaria 2 mm longa, viridia; styli 1.5 mm longi, inferne glanduloso-pubescentes.

Turkey. A4 Çankiri: Isik Dağ, near summit, steep slopes, 17 viii 1960, Khan, Prance & Ratcliffe 724A (holo—E), C. 5968. A6 Amasya: Ladik, Ak Dağ, from Dere Basalan Koy, 1700 m, organic soil and limestone rock crevices, 19 v 1965, C. Tobey 639A.

This is a very distinct small plant, easily separated from *S. gillianii* by the fleshy, sea-green leaves with a minute dark apex. The leaf pubescence is unusually short and even and the marginal ciliation hardly distinct. The flowers are small but solid and the stamens short, with swollen, violet filaments.

10. *S. minus* Turrill in Hooker, Icon. Pl. 5: t. 3401 (1940). Fig. 5.

Type: first figured and described from living material grown at Kew and collected by E. K. Balls on Haldizan Dağ, Asia Minor, (K).

Turkey. A7 Trabzon: Macka, growing in crevices on non-lime rocks, 609 m, 12 vii 1933, E. K. Balls 484 (with *S. armenum*). A8 Rize: distr. Pazan, below Ortaköy Hemsin, 2000 m, 2 ix 1952, Davis (plants only); Cermanin Tepe, 10 viii 1952, Davis (plants only).

This is the smallest species so far known and unlikely to be confused with any other Turkish *Sempervivum*. The rosettes are from 1 to 1.5 cm across, very compact, with oblong-ob lanceolate leaves, dull green or bronze-tinged and densely pubescent. The few-flowered inflorescence is characteristic, with flowers large for the size of the plant and the stem leaves only twice as long as wide. The styles are unusually slender, strongly recurved, practically equalling the ovary in length instead of being considerably shorter as in most species of *Sempervivum* and the scales are slender and longer than wide.

So far *S. minus* is known only from the provinces of Trabzon and Rize where it was found by Balls growing with *S. armenum* and a glandular leaved species and it is most probable that hybrids occur. One variety has been described:

var. **glabrum** Wale in Bull. Alp. Gard. Soc. 10:240, 236, 238 (1942).

This differs in the larger rosettes (2–3 cm) and glabrous purple-based leaves. It was found on Haldizan Dağ by E. K. Balls and also on Djimil Dağ nearby.

11. *S. transcaucasicum* Muirhead in Notes R.B.G. Edinb. 26:284 (1965).

Type. Caucasus. Georgia: Tbilisi, hillsides near the Dabahane gorge, opposite the Tbilisi Botanical Institute, 550–650 m, rocky metamorphic slope, flowers pale yellow, 29 vi 1959, Davis 33719 (holo—E).

Syn.: *S. georgicum* Gurgendze in Not. Syst. Geogr. Inst. Bot. Tiflis 25:10 (1965).

Turkey. A8 Artvin: Şavval Tepe above Murgul, 2700 m, igneous rocks, flowers yellow, 12 viii 1957. *Davis & Hedge D.* 32292, *C.* 5969.

This species, which is probably widespread in the Transcaucasus has so far only been recorded once in NE Turkey. It is a well marked species with yellowish green, shortly glandular rosette leaves tinged with pink on full exposure and rather large flowers (2-3 cm in diameter) with lavender-based petals. The linear lanceolate calyx lobes, slightly incurved at the apex, densely glandular, light purple filaments and rectangular upcurved scales distinguish it from *S. davisii* and *S. artvinense* which occur in the same area.

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